CURRENT RECYCLING & REUSE PROGRAMS

If carpet fiber can be recovered and cost effectively processed to a high level of purity (95% or better), recycled fiber could be used in place of virgin fiber. Numerous companies within the carpet industry support reuse and recycling which has resulted in the independent development of a variety of programs. Four different sectors are developing recycling and reuse programs.

1. INDUSTRY-WIDE

Identification Codes—The Carpet & Rug Institute (CRI), the foremost carpet industry trade association, recently introduced the Carpet Component Identification Code (CCIC), a carpet labeling system that identifies 8 components, including face fiber, backing(s), and adhesive(s), through a stamp on the carpet backing. The labeling system makes job site identification possible and would enable recyclers to limit collection programs to carpets with desirable components. A large number of manufacturers are now participating.

2. CARPET MILLS

Collins & Aikman's (C&A) Infinity Initiative—combines consumer carpet waste with manufacturing carpet scrap to make a 100% recycled-content carpet tile backing. C&A has shifted all production to use of this new, recycled, vinyl-based backing. C&A collects and recycles its own carpet, as well as any vinyl/nylon composite backing made by other manufacturers. C&A continues to market other products, including parking stops and industrial flooring. Contact Lee H. Schilling 800/248-2878 x2070, or visit *www.powerbond.com.*

Interface Flooring—operates a recycling program for those purchasing, as well as, leasing carpet tiles. The program ensures that carpet returns to Interface for reconditioning or recycling instead of being disposed. In designing their collection and recycling program, Interface considers the embodied energy of the carpet and the energy required for transportation. Contact Chris Cady 800/336-0225 x2340, or visit *www.ifsia.com.*

Milliken's Earth Square—carpet tiles are returned to Milliken for rejuvenation, including cleaning, retexturizing, and imprinting of a new pattern. Milliken helps customers that are renewing their carpet to select a design and then returns the carpet for reinstallation. The program processes millions of square yards per year. Milliken is actively promoting the environmental benefits of the program. Contact Bill Blackstock 706/880-3221, or visit *www.milliken.com/e2.*

Recycled-content carpet—numerous companies including **Image Industries, Marglen Industries, Shaw Industries**, and **Talisman Mills** produce and market recycled PET (polyester) fiber content carpets. The fiber is made from recovered PET beverage bottles. As the price of nylon fiber increases, more carpet manufacturers are beginning to use less expensive polyester fibers or blends, creating a larger market for competitive recycled-content carpets.

3. FIBER MANUFACTURERS

Some fiber manufacturers operate collection and recycling programs aimed at commercial carpet. The economies of scale and the fewer handling pathways typical of commercial carpet make collection programs simpler to operate.

AlliedSignal has carpet collection operations across the United States and is in the process of commercializing a patented depolymerization technology to generate virgin-quality, recycled-content resin from waste carpet face fiber. AlliedSignal collects all nylon 6 carpet without any requirements for the purchase of AlliedSignal-fiber carpet. Contact Michael Costello 804/520-3165, or visit *www.n6recycling.com*.

BASF's 6ix Again—a take-back program begun in 1994 for all carpets made with BASF nylon 6 fiber displaying a BASF stamp on the backing. In 1997, BASF expanded their program to include take back of any carpet when BASF-fiber carpet was installed. BASF recovers the face-fiber for closed-loop recycling into new carpet fiber or other useful products. Contact Tim Blount 800/652-9964, or visit *www.basf.com.*

DuPont's Carpet Reclamation℠ Program—any type of commercial carpet is collected for a fee from parties that purchase carpet from DuPont Flooring System dealers. Over 70 collection sites deliver post-consumer carpet to the central processing facility in Thompson, GA. Recycled products include a 25% recycled-content resin for car air-cleaner housings, vinyl utility tiles and fiberized products for padding, soundproofing, and soil enhancement. DuPont is also pursuing closed-loop recycling using depolymerization technology, although this process requires larger waste quantities than are currently collected. Contact Mark Ryan 770/420-7791, or visit *www.dupont.com.*

4. PRIVATE RECYCLERS

United Recycling, Inc. of St. Paul, Minnesota recovers face fibers from used carpet for sale as feedstock to manufacturers for thermoplastic applications. The company extracts nylon and other polymer fibers from virtually the entire range of broadloom carpet, utilizing environmentally responsible dry processes. Carpet is collected from carpet retailers and installers. Contact Charlie Pyle 612/521-1111.

Post-industrial nylon product.

RESOURCES

The Carpet & Rug Institute: primary national trade association for the carpet industry, offering the industry and the general public with technical, educational, and issue-related information. Contact R. Carroll Turner: 706/278-3176 x106, or visit *www.carpet-rug.com*.

Carpet Cushion Council: trade association for carpet underlayment manufacturers. Contact Bill Oler: 203/637-1312, or visit *www.carpetcushion.org.*

Polyurethane Recovery and Recycling Council: association provides information for polyurethane recyclers. Contact Jennifer Hayward 202/974-5363, or visit *www.polyurethane.org/PURRC.*

Environmental Building News, Brattleboro, VT. "New Life for Old Carpets", Vol.6, No.6, June 1997. 802/257-7300, or visit *www.ebuild.com.*

Big Bob's New & Used Carpet, has franchises in 18 states that sell both new and used carpet to the entry-level market. Contact David Elyachar 913/782-1991, or visit *www.bigbobscarpet.com.*

Air intake manifold made from recycled nylon 6 fiber.

Photos for this brochure provided by AlliedSignal, Inc.

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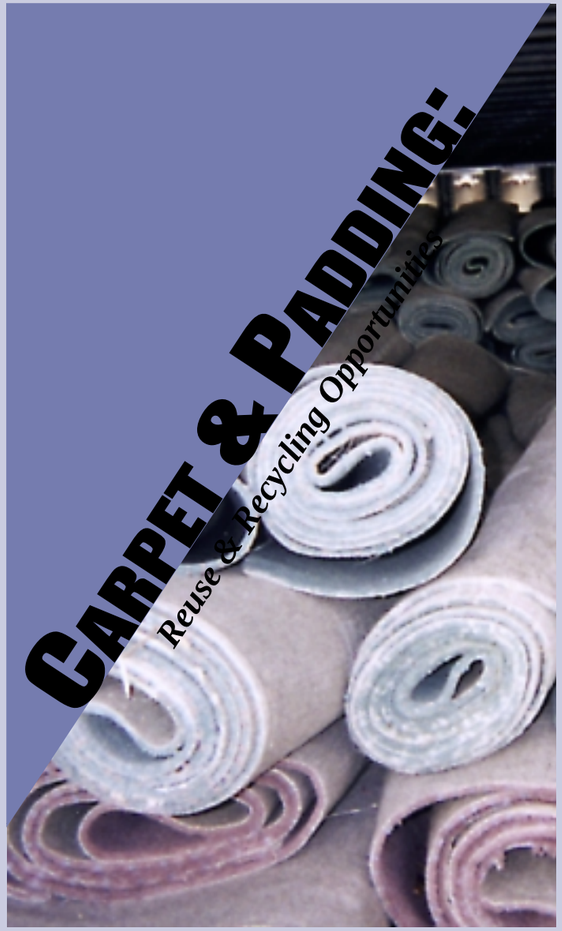

A guide for retailers, installers, solid waste planners,recyclers, and consumers.

NAHB RESEARCH CENTER℠

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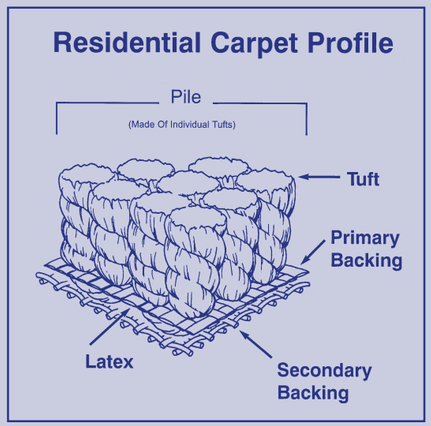
LAYING OUT THE CARPET WASTE PROBLEM

- In 1997, manufacturers produced **1.7 billion square yards** of carpet, enough to cover New York City's five boroughs more than 1½ times.
- Carpet covers nearly **70% of the floor space** of new homes built in the 1990s.
- In 1996, 70% of annual carpet production was used to replace existing carpet. These replacements produced almost **2 million tons of waste carpet and padding**, equivalent to about 1% by weight & 2% by volume of annual municipal solid waste.

Shredded carpet ready for processing.

Carpet and carpet padding are generated simultaneously, yet their waste management options have developed at different rates. Currently, padding is cost-effectively recycled. But, while technology exists to recycle carpet, and some carpet fibers are desirable in new products, commercial-scale collection and recycling is not yet readily available. Some of the obstacles include the material complexity of carpet as compared to padding and the complex handling practices for carpet waste. The carpet industry is currently developing and testing many recycling and reuse programs designed to overcome these barriers.



CHARACTERISTICS OF CARPET & PADDING WASTE

The two basic types of carpet, residential and commercial, are both composed of face fiber, primary and secondary backings, and an adhesive layer. Residential carpet is 30 - 60% fiber by weight, but commercial carpet is only 20 - 30% fiber by weight. Residential carpet comes in sheets and is placed over padding, whereas commercial carpet does not require padding and may come in sheets or squares known as tiles. Padding is generally a homogenous sheet product, such as polyurethane foam or rubber. The table below summarizes carpet and padding's basic characteristics.

Waste carpet is about 75 - 80% of the re-carpeting waste stream with padding, packaging, and fasteners or adhesives making up the rest. The bulkiness of carpet and padding waste can make disposal very costly, encouraging an interest in cheaper alternatives to disposal.

Comparison of Padding & Carpet Characteristics

	PADDING	CARPET
Product Composition	1 Material: foam or fiber pad	4 Materials: face fiber, primary backing, adhesive, secondary backing
Primary Recyclable Component	100% of foam pad	Face Fiber: 20-60% by weight (must be separated from weave)
Market Share	4 Types of Pad: polyurethane 90%, synthetics 5%, rubber 4%, jute 1%	6 Types of Fiber: nylon 6,6 > nylon 6 > 60%, Olefin (polypropylene) 34%, polyester, wool, & blends 6%
Identification	Visual inspection at job site; easy to identify types	Test away from job site: melt, formic acid, or near infrared
Handling	Homeowner: curbside or installer disposal Installer: dispose, recycle, back to retailer Retailer: dispose or recycle	
Miscellaneous	Bulky Generated in disperse locations Generated in varying quantities	

Rolls of carpet collected for delivery to a nylon 6 recycling facility.

BENEFITS OF REUSE & RECYCLING

Save Money—*Waste generators* can reduce or eliminate disposal costs by reusing or recycling padding or carpet. *Purchasers* can reduce replacement costs by purchasing used carpet or recycling the removed carpet and padding. Donating carpet for reuse to a non-profit organization is tax deductible. A recycler's fee for material drop-off may be less than local tip fees, or it may eliminate the need for renting dumpsters.

Use Resources Efficiently—Reusing or recycling carpet or padding waste prevents the disposal of valuable materials. Also, recycled carpet and padding components can replace some virgin resources used in the manufacture of padding, fiber, and other products, such as the 1 million tons of nylon fiber and 500,000 tons of polypropylene consumed by carpet production each year.

Meet Waste Reduction Goals—State and local governments can increase their waste diversion and recycling rates by facilitating and encouraging padding and carpet reuse and recycling (for states that count carpet and padding toward recycling goals). Reducing disposal also helps extend the life of landfills.

ISSUES IN COST-EFFECTIVE RECYCLING

Although carpet and padding waste are generated simultaneously, a variety of factors have resulted in the slower development of recycling for carpet versus padding.

Padding – Pad recycling has developed and succeeded because:

- padding is a simple product, composed of one material, which can be visually identified and for which 90% of the market is polyurethane foam;
- the used padding can be easily processed into recycled pad, a product competitive with new foam pad;
- used padding has a commodity value in the recyclables market that provides an economic incentive for generators to bring waste pad to collection points; and
- padding is mostly generated in the residential setting, with smaller amounts generated from commercial settings.

Carpet – By contrast, carpet recycling is more difficult because:

- carpet consists of multiple components, of which only a relatively small amount is recyclable (see the table under "CHARACTERISTICS");
- the face fiber type must be identified via testing, removed from the weave, and shipped to a processor;
- the responsibility of handling carpet waste is divided among homeowners, installers, distributors, and retailers; and
- carpet waste is generated in both residential and commercial settings, often with different installers and distributors for these two markets.

ALTERNATIVES TO DISPOSAL

The cost of disposal along with the value contained in padding and carpet has driven the development of reuse and recycling programs.

Reuse

In general, building material reuse centers accept used carpet if it's in good condition and clean. Reuse is not an option for padding because it cannot be cleaned. See the reverse side for list of CURRENT PROGRAMS and RESOURCES.

Carpet may be in very good condition because it is often replaced long before it has become unusable. Reusability is affected by a carpet's age, its size and condition, and the presence of stains or "contamination", such as chemicals or animal residues. In preparation for reuse, carpet typically undergoes a reconditioning process, which may be as simple as cleaning and deodorizing or may involve dyeing and retexturizing.

Bundled carpet on conveyor belt to be recycled.

Recycling

Approximately 125,000 tons of pre- and post-consumer polyurethane foam pad (the most common type of padding) are recycled each year into "rebond" foam pad, a shredded and reformed product. Other types of padding are not recycled because of their smaller volume, lower value and/or unrecyclability.

Carpet recycling can involve material of any age, type, or condition. In 1997, approximately 10 to 15 million pounds of carpet were collected in recycling projects. Carpet is collected and sometimes sorted by face fiber type prior to processing in one of two basic recycling processes:

- *whole-carpet*: carpet is treated as one basic material and is "downcycled" into new products. Recycled carpet products include parking barriers, geotextiles, lumber alternatives, fiberboard, sod reinforcement, carpet tack strips, and concrete reinforcing additives.
- *fiber-recovery*: carpet is classified by its face fiber type and face fiber is recovered (mechanically or chemically) for use in pure fiber products such as under-the-hood automobile parts and pure fiber resins. Recovering nylon fiber and recycling it into high quality nylon resin offers an infinite closed-loop recycling opportunity.